Changing Skyline / Bridge that's way beyond pedestrian

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For most bridge designers, the goal is to connect two points in the shortest, most efficient way. But clearly British engineer Cecil Balmond would rather take the long way home. His latest design, a pedestrian bridge for the University of Pennsylvania, promises to be a full-blown adventure trek, with looping turns and whooshing slaloms.

On the outside, the design resembles one of those hollow braided finger toys found in Chinatown. But users moving up its gentle east-side ramp will soon discover themselves sucked into a coiled spiral that acts like David's slingshot to propel them through the tubelike space of the main span. Without any vertical supports, that 145-foot-long braided tube appears to defy gravity.

And to think the bridge's only purpose is to help students cross some railroad tracks.

For Balmond, an acclaimed engineer with the London firm Ove Arup, the need to span part of Amtrak's Northeast Corridor turned out to be a happy excuse to tinker with bridge-building traditions. When his railroad overpass sets down in summer 2008, in the university's back country between Franklin Field and the Schuylkill Expressway, it will be part sculpture, part mathematical puzzle, part thrill ride.

The Weave Bridge, as Balmond calls it, is also starting to look like the great modern bridge that Philadelphia has longed for. Of course, plenty can go wrong between now and installation. But its ambition alone should buoy the spirits of a citizenry deeply disappointed by the banality of the new South Street Bridge design.

At least we have that project to thank for the existence of the Weave Bridge. For all its engineering hijinks, Balmond's $2.4 million structure has a job to do. When the South Street Bridge goes down in 2008 for an expected 18-month reconstruction, Penn's playing fields and Hollenback Hall will be severed from the campus by Amtrak's rail line. The Weave Bridge will serve as a lifeline to Penn's southeastern corner.

Penn initially planned to construct a purely functional, temporary walkway over the Amtrak rails. But as it was putting the finishing touches on its new 30-year master plan with consultant Sasaki Associates, the university began to see the overpass as a kick-off project that could demonstrate its commitment to bold architecture. It sought out Balmond, who, despite being an engineer, teaches an architecture studio in the School of Design.

Balmond, who was born in Sri Lanka and raised in Nigeria, isn't as famous as Santiago Calatrava, the Spanish engineer who has muscled into architecture, but that may soon change. For more than three decades, Balmond has been the guy with the slide rule (and the computer models) behind the amazing structural gymnastics of Rem Koolhaas, Daniel Libeskind, and UNStudio's Ben van Berkel.

The common denominator in the work of those architects is a fascination with tricky internal spaces - and the innovative engineering structures that are necessary to make such layouts and volumes possible. It's clear that projects like Koolhaas' Mobius-strip CCTV tower in Beijing couldn't have been designed without Balmond's collaboration.

With the completion last year of Balmond's own charmingly asymmetrical bridge in Coimbra, Portugal, he finally got to affix his signature to a project. The Weave Bridge will be an important next step for Balmond's Advanced Geometry Unit at Arup, a sort of think tank, or R&D unit, that he founded inside the engineering giant. Working together with Daniel Bosia and a select group of designers, he specializes in finding elegant solutions to engineering problems.

Balmond may be dipping more into architecture, but engineering structure remains his point of departure. Unlike Frank Gehry, who is happy to drape his bloblike forms onto any old framework that can hold them up, Balmond sees structure and design as one and the same. There are no vertical supports holding up the Weave Bridge because its twisting stainless-steel strips carry the load, in the way that cables and trusses do on conventional bridges.

Balmond came up with the idea of supporting the span with crisscrossing strands of metal after visiting the site, and noting its sharp contrasts. Penn's playing fields exist as a pastoral oasis, oblivious to three of Philadelphia's busiest transit arteries - the Amtrak rails, Interstate 76, and SEPTA's train lines.

Balmond said he quickly realized that the purpose of his bridge was to weave the disparate landscape elements together. By the next day, he had drawn six sketches showing double helixes of twisted strands. They became both the bridge's main design element and its structure.

On the east side of the Amtrak rails, the strands will wind themselves into a spiral. It becomes a pivot that directs users up the ramp and over the tracks. But the form also serves as a storehouse of coiled energy that provides what Balmond calls a "shot-and-release" function, the better to launch users across the main span. It's like someone who takes a few steps back before making a jump.

As Balmond's strands unfurl, they create an irregular geometry of triangular openings. Because Amtrak demands that any walkway over its electrified lines have solid walls, he was obliged to fill in the spaces with solid materials. The lower triangles and floors will be wood timbers, but Penn hopes Amtrak will allow the upper portions to be a translucent polycarbonate, so bridge users will have a vague sense of their surroundings. Except for the crisscrossing steel, the tube's roof will be open to the sky.

Even with the translucent panels and the sky openings, people could feel a bit claustrophobic inside the tube, not to mention a little unsafe. That would certainly undercut Balmond's desire to make the crossing something to be experienced and enjoyed. The university promises to keep the area well-policed.

Perhaps a day will come when Balmond's bridge isn't so far off the beaten path. Although his railway overpass should not be confused with Penn's proposed pedestrian bridge over the Schuylkill River,it could perhaps serve as its launch pad.

If the university puts this much effort into a simple overpass, imagine what it could do with a full-size bridge. The results might almost be enough to make us forget our disappointment over the South Street bridge.